

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
9 October 2003 (09.10.2003)

PCT

(10) International Publication Number
WO 03/083334 A1

(51) International Patent Classification⁷: **F16K 11/087**

(21) International Application Number: **PCT/NL03/00212**

(22) International Filing Date: **21 March 2003 (21.03.2003)**

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:
10/113,407 1 April 2002 (01.04.2002) **US**

(71) Applicant (for all designated States except US): **FLUID MANAGEMENT, INC.** [US/US]; Patent Department, 1023 Wheeling Road, WHEELING, IL 60090-5776 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **VOSKUIL, Marcus, Johannes** [NL/NL]; Willem van Otterloolaan 11,

NL-2343 MH OEGSTGEEST (NL). **ALKEMADE, Petrus, Johannes, Maria** [NL/NL]; Bleihof 45, NL-2215 XT VOORHOUT (NL).

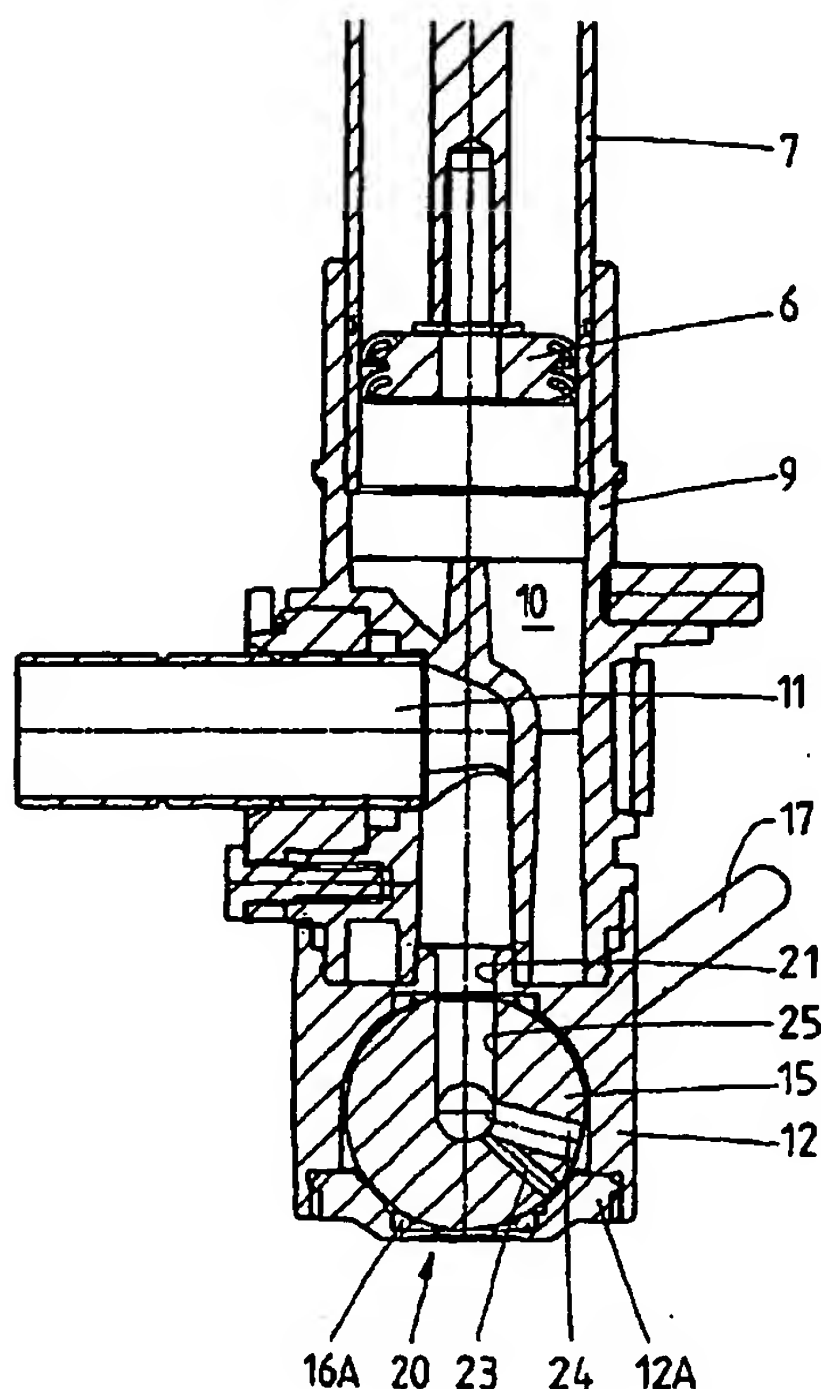
(74) Agent: **AALBERS, Arnt, Reinier; DE VRIES & MET-MAN**, Overschietaat 180, NL-1062 XK AMSTERDAM (NL).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,

[Continued on next page]

(54) Title: **VALVE ASSEMBLY**



(57) Abstract: A valve assembly for a fluid dispenser includes a housing having at least a first opening (19) and a second opening (20), and a valve member fitted in the housing, the valve member (15) being rotatable about an axis and comprising a first channel (22), extending along said axis and communicating with the first opening in the housing, and at least two outlet channels (23, 24) radially extending from the first channel to the circumference of the valve member, wherein each of the radially extending outlet channels can be brought in register with the second opening by rotating the valve member.

WO 03/083334 A1

BEST AVAILABLE COPY



ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

Published:

— with international search report

VALVE ASSEMBLY

Technical Field

A valve assembly for a fluid dispenser and a fluid dispenser comprising the same are disclosed.

Background of the Related Art

Valve assemblies for viscous fluid dispensers are known from U.S. Patent No. 6,003,731. Figures 16 and 19a-19d of the '731 patent show a pumping arrangement (117) adapted to draw fluid from a package (101) and subsequently expel the fluid in accurate dosages.

However, the valve assembly disclosed in the '731 patent is prone to clogging and therefore can be unreliable and require frequent maintenance procedures. Further, the valve assembly disclosed in the '731 patent includes only one outlet opening or channel and therefore the dispensing apparatus of the '731 patent can perform at only limited dispense rates.

Therefore, there is a need for an improved valve assembly for liquid dispensers which are more reliable, require less maintenance and which are capable of dispensing at slower, more accurate dispense rates and faster dispense rates.

Summary of the disclosure

A valve assembly for a dispenser for viscous fluids is disclosed which comprises:

- a housing having at least a first opening and a second opening, and

- a valve member fitted in the housing, the valve member being rotatable about an axis and comprising a first channel, extending along said axis and communicating with the first opening in the housing, and at least two outlet channels radially extending from the first channel to the circumference of the valve member;

- wherein each of the radially extending outlet channels can be brought in registry with the second opening by rotating the valve member.

Thus, one of two or more outlet channels are available, rendering the valve assembly more versatile, e.g., by employing outlet channels that are mutually different, and/or more reliable, e.g., when one of the outlet channels is no longer operational as a result of fouling or clogging, another outlet opening can be used.

In an embodiment, the diameter of at least one of the radially extending outlet channels differs from that of the other channel(s). For example, one channel can have a small diameter suitable for precision dispensing, whereas the other has a (relatively) large diameter for rapidly dispensing (relatively) large amounts.

In a further preferred embodiment which is especially suitable for use in association with a buffer or pump, the housing comprises a third opening and

the valve member further comprises an inlet channel, radially extending from the circumference of the valve member to the first (axial) channel;

wherein the inlet channel can be brought in register with the third (inlet) opening by rotating the valve member.

The diameter of the second (outlet) opening in the housing may be larger than the diameter of at least some or all of the radially extending channels. In such a configuration, the fluid will be dispensed directly from the valve member, i.e., without an additional spout or nozzle, and fouling is reduced.

An apparatus for dispensing viscous fluids is also disclosed which comprises:

a turntable rotatable around an axis of rotation;

a plurality of pumps attached to and distributed around the axis of the turntable;

at least one of the pumps comprising a valve assembly according to the present invention.

The apparatus can be used, e.g., as a dispenser for several different pigments, colorants, base paints and/or additives, such as solvents or binders, which can be mixed with each other or, e.g., with a further base paint, at a point of sale.

Brief description of the drawings

The disclosed valve assembly and dispensing apparatus will be further explained with reference to the accompanying drawings in which an embodiment is shown schematically.

Figure 1 is a perspective view of a part of a disclosed apparatus for dispensing viscous fluids;

Figure 2 is cross-sectional side view of a disclosed valve assembly suitable for use in the apparatus of Figure 1;

Figure 3 is a partial detail view of the valve assembly of Figure 2; and

Figure 4 is a cross-sectional front view of the valve assembly as shown in Figure 3.

It is noted that the drawings are not necessarily to scale and that details, which are not necessary for an understanding of the present invention, may have been omitted. As a matter of course, the disclosure is not limited to the particular embodiments illustrated herein.

Detailed description of the presently preferred embodiments

Figure 1 illustrates the main parts of an example of an apparatus 10 for dispensing viscous fluids, such as paints or dyes. This particular dispensing apparatus is an automated version and includes a turntable 1. The turntable 1 is rotatable about a vertical axis by means of a drive (not shown) in order to rotate the turntable 1 between discrete positions.

On the turntable 1, there is mounted a plurality of pumps 2, e.g., sixteen pumps. Each pump 2 is associated with a fluid container, in this case two types of fluid containers: alternately a stationary type canister 3 and a replaceable flexible package (not shown) contained in a rigid, removable holder 4. When one of the canisters 3 is empty or nearly empty, it should be refilled by pouring fluid, such as a paint component, into it. When a flexible package is empty, the package and the holder 4 containing it can be removed. Subsequently, the holder 4 can be opened to take out the empty package and to insert a new, filled package, upon which the holder 4 and the filled package can be placed back in the original position. Further details of the said apparatus are

disclosed in U.S. Patent No. 6,273,298, the contents of which are incorporated herein by reference.

Figures 2 to 4 show cross-sections of an embodiment of a pump 2 associated with a valve assembly suitable for use in the apparatus of Figure 1. The pump 2 is of the piston-type and includes a piston rod 5 provided with a piston 6, disposed within a cylinder 7 of the pump 2, and an upper flange 8. This flange 8 that can be engaged by an actuator (not shown) adapted to move the piston rod 5 and the piston 6 upwards during an intake stroke and downwards during a discharge stroke. The actuator is stationary and the turntable 1 is adapted to position one of the pumps 2 in line with the actuator in order to enable it to actuate the pump 2.

The cylinder 7 is mounted in the top part of a pump housing 9, which defines a cavity 10 and further includes an inlet channel 11 that is separated from the cavity 10 and adapted to be in fluid communication with a fluid container 3, 4 as shown in Figure 1. A valve housing 12, comprising a cover 12A, is attached to the lower part of the pump housing 9 by means of respective flanges 13, 14. A valve member, preferably a ball valve 15, is fitted in the housing 12 by means of two annular bearings 16A, 16B made of, e.g., a polymeric material, such as PTFE (Teflon™). The valve member 15 is provided with a lever 17 with which it can be rotated about an axis A.

In the disclosed valve assemblies, it is generally preferred that the valve member is of the ball type. At normal operating temperatures, within a range from 0 to 50 °C, ball type valves are less sensitive to leaking and/or seizing resulting from temperature changes than, e.g., cylindrical valves.

The valve housing 12 further defines a cavity 18 limited at its upper part by a first opening 19, through which the cavity 18 communicates with the cavity 10 of the pump housing 9. The valve housing 12 further includes a second or outlet opening 20 in its bottom part and a third opening 21 which communicates with the inlet channel 11 in the pump housing 9.

The valve member 15 includes a first channel 22, extending along the axis A and communicating with the first opening 19 in the housing 12. It further includes at least two outlet channels 23, 24 and an inlet channel 25, all radially extending from the first channel 22 to the circumference of the valve member 15.

In this particular embodiment, the diameter of one of the outlet channels 23 is smaller than that of the other 24 and the diameter of both outlet channels 23, 24 is smaller than that of the inlet channel 25. Further, both of these diameters are smaller than the diameter of second or outlet opening 20 and the central axes of channels 23-25 are all located on the same sectional plane through the valve member 15 and are respectively, e.g., 30° and 100° apart.

Figure 2 shows the intake position of the valve member, where the inlet channel 25 of the valve member 15 is in registry with the third opening 21 of the valve housing 12 and thus with the inlet channel 11. In other words, the fluid container communicates with the cavity 10 in the pump housing 9 and the cylinder 7. In this position, the cavity 10 and cylinder 7 now can be filled with a desired amount of the fluid from the container by moving the piston 6 upwards over a desired or predetermined length. It is noted that, in this position, the inlet channel 22 temporarily serves as an outlet channel.

As soon as an appropriate amount of fluid is taken in, the valve member 15 can be rotated to the desired dispensing position, i.e., until the desired output channel 23, 24 is in register the outlet opening 20, which in this particular embodiment amounts to a travel of respectively 50° and 80°, and the piston 6 can be moved downwards to dispense a desired or predetermined amount from the said opening 20. If this amount of fluid is relatively small and/or the dosage should be precise, the relatively narrow output channel 23 is appropriate and, if this amount is relatively large and/or should be dispensed rapidly, the relatively wide output channel 24 is appropriate.

Thus, the valve assembly enables the tailored and, if need be, precise and/or rapid dispensing of viscous fluids, without having to exchange the valve assembly or components of the valve assembly.

It is generally preferred that the angle between the inlet channel on the one hand and each of the outlet channels on the other is at least 90° , since in that case the rotational distance between the intake and discharge positions and thus the travel of the valve member is relatively small.

It is further preferred that the height of the second or outlet opening at the bottom side of the valve housing is less than 1 mm, e.g., 0,5 mm, so as to further reduce fouling and/or facilitate the cleaning of the said outlet opening.

The valve assembly is not restricted to the embodiment shown in the drawing and described herein before. For example, the number of outlet channels as well as their relative locations in the valve member can be varied at will. Also, the valve assembly can be mounted directly onto or into (the bottom part of) a container, i.e., without the presence of a pump mechanism. As a further example, the above-mentioned parts, in particular the housings, can be made of any suitable material, e.g., a metal, such as stainless steel, of a polymer material, such as POM or PEEK.

What is Claimed:

1. A valve assembly comprising:
a housing having at least a first opening and a second opening, and
a valve member disposed within the housing, the valve member being rotatable about an axis and comprising a first channel extending along the axis and communicating with the first opening in the housing, and at least two outlet channels extending radially from the first channel to a circumference of the valve member;
wherein each of the radially extending outlet channels can be brought in registry with the second opening by rotating the valve member.
2. The valve assembly according to claim 1, wherein a diameter of one of the radially extending outlet channels differs from a diameter of the other outlet channel.
3. The valve assembly according to claim 1, wherein the radially extending outlet channels are disposed at an angle with respect to each other.
4. The valve assembly according to claim 1, wherein the housing comprises a third opening; and
the valve member further comprises an inlet channel, radially extending from a circumference of the valve member to the first channel;
wherein the inlet channel can be brought in registry with the third opening by rotating the valve member.
5. The valve assembly according to claim 4, wherein an angle between the inlet channel and each of the outlet channels is at least 90°.
6. The valve assembly according to claim 1, wherein a diameter of the second opening in the housing is larger than a diameter of at least some of the radially extending outlet channels.
7. The valve assembly according to claim 6, wherein a height of the second opening is less than 1 mm.
8. The valve assembly according to claim 1, wherein the valve member is substantially ball-shaped.

9. A dispenser for a viscous fluid comprising a valve assembly according to claim 1 and a pump mechanism associated with the said assembly.

10. An apparatus for dispensing fluids, comprising:
a turntable rotatable around an axis of rotation;
a plurality of pumps attached to and distributed around the axis of the turntable;
at least one of the pumps comprising a valve assembly according to claim 1.

11. A valve assembly comprising:
a housing having at least a first opening, a second opening and a third opening, and
a valve member disposed within the housing, the valve member being rotatable about an axis and comprising a first channel extending along the axis and communicating with the first opening in the housing, and at least two outlet channels extending radially from the first channel to a circumference of the valve member, the outlet channels having differing diameters, the valve member further comprising an inlet channel, radially extending from a circumference of the valve member to the first channel;

wherein each of the radially extending outlet channels can be brought in registry with the second opening by rotating the valve member and wherein the inlet channel can be brought in registry with the third opening by rotating the valve member.

12. The valve assembly according to claim 11, wherein the radially extending outlet channels are disposed at an angle with respect to each other.

13. The valve assembly according to claim 11, wherein an angle between the inlet channel and each of the outlet channels is at least 90°.

14. The valve assembly according to claim 11, wherein a diameter of the second opening in the housing is larger than a diameter of at least some of the radially extending outlet channels.

15. The valve assembly according to claim 14, wherein a height of the second opening is less than 1 mm.

16. The valve assembly according to claim 11, wherein the wherein the valve member is substantially ball-shaped.

17. A dispenser for a viscous fluid comprising a valve assembly according to claim 11 and a pump mechanism associated with the said assembly.

18. An apparatus for dispensing fluids, comprising:
a turntable rotatable around an axis of rotation;
a plurality of pumps attached to and distributed around the axis of the turntable; at least one of the pumps comprising a valve assembly according to claim 11.

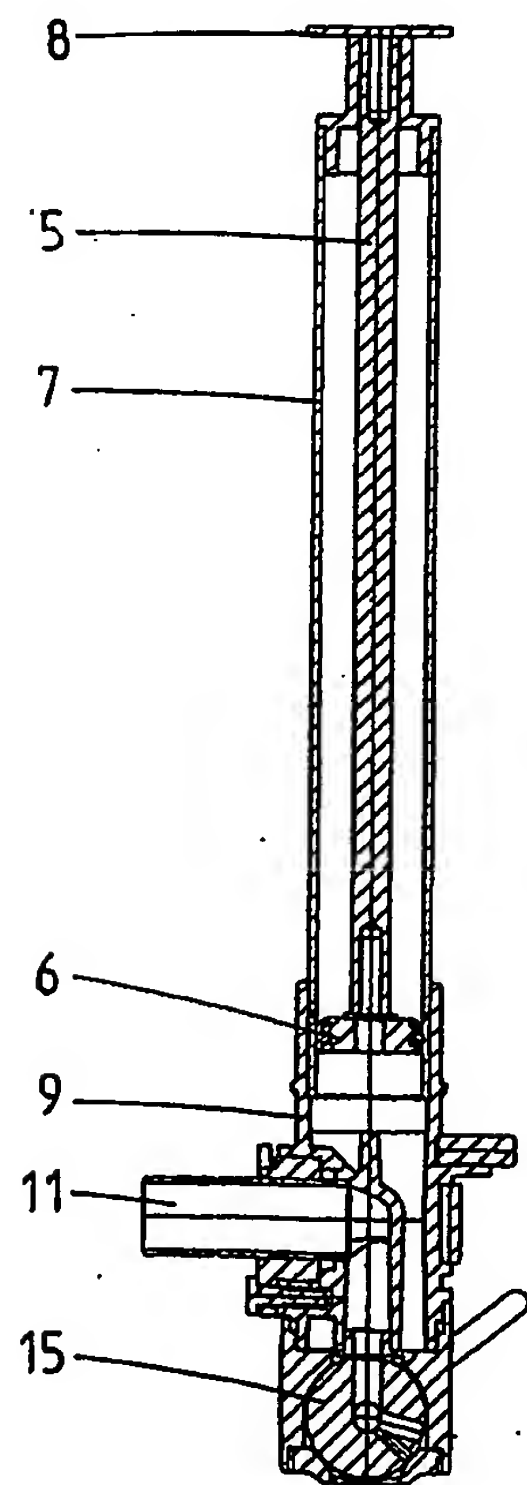
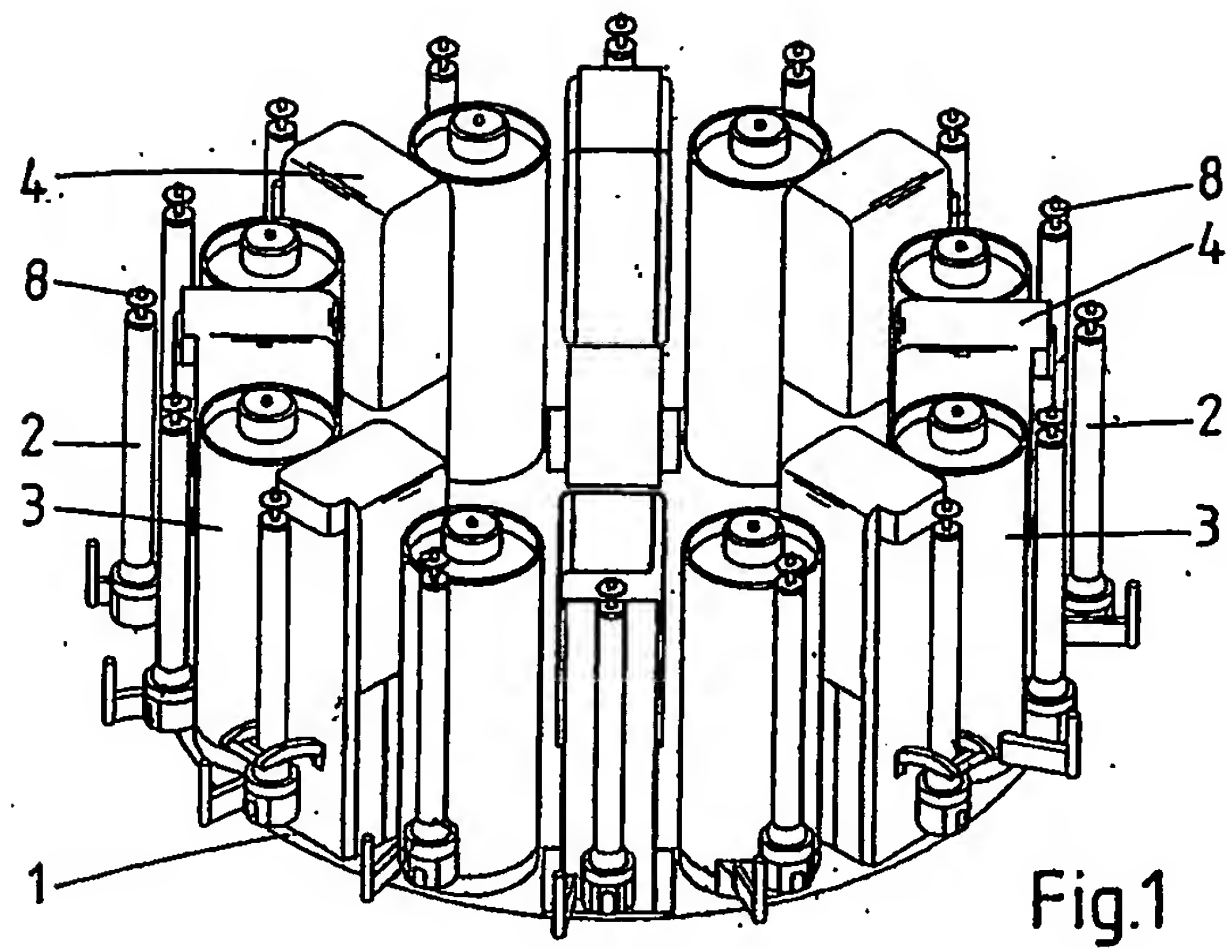


Fig.2

2/2

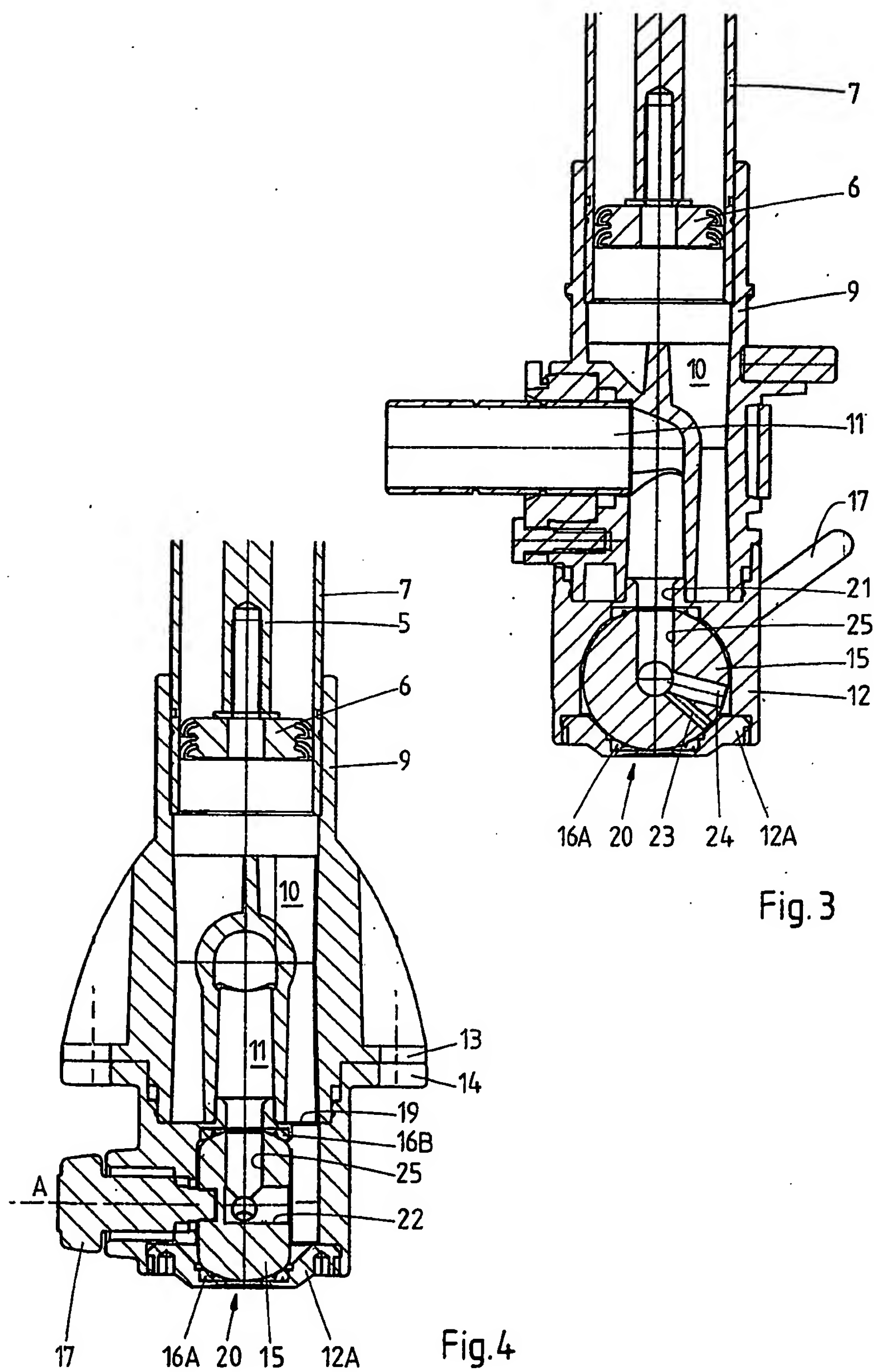


Fig. 3

Fig. 4

INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 03/00212

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F16K11/087

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F16K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Y | US 5 632 816 A (KHATTAB GHAZI M A ET AL) 27 May 1997 (1997-05-27) | 1-4, 6, 8, 9, 11, 12, 14, 16, 17 |
| A | column 8, line 4 - line 57; figure 1 | 10, 18 |
| Y | EP 0 843 116 A (PISTER KUGELHAEHNE GMBH ;STOLCO STOLTENBERG LERCHE GMBH (DE)) 20 May 1998 (1998-05-20) column 4, line 33 -column 5, line 2; figures 1,2 | 1-4, 6, 8, 9, 11, 12, 14, 16, 17 |
| A | US 6 273 298 B1 (POST JOHANNES HERMANUS NICOLAA) 14 August 2001 (2001-08-14) cited in the application abstract; figure 1 | 10, 18 |

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *g* document member of the same patent family

Date of the actual completion of the international search

19 June 2003

Date of mailing of the international search report

26/06/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Christensen, J

INTERNATIONAL SEARCH REPORT

Information on patent family members

International / ation No

PCT/NL 03/00212

| Patent document cited in search report | | Publication date | | Patent family member(s) | Publication date |
|-------------------------------------------|----|---------------------|----|----------------------------|---------------------|
| US 5632816 | A | 27-05-1997 | DE | 19524853 A1 | 18-01-1996 |
| | | | GB | 2291823 A ,B | 07-02-1996 |
| | | | JP | 8182940 A | 16-07-1996 |
| | | | US | 5725150 A | 10-03-1998 |
| | | | FR | 2722430 A1 | 19-01-1996 |
| | | | US | 5787928 A | 04-08-1998 |
| | | | US | 5944045 A | 31-08-1999 |
| | | | US | 5746831 A | 05-05-1998 |
| EP 0843116 | A | 20-05-1998 | DE | 19707534 A1 | 28-05-1998 |
| | | | EP | 0843116 A2 | 20-05-1998 |
| | | | NO | 975262 A | 20-05-1998 |
| US 6273298 | B1 | 14-08-2001 | AT | 240257 T | 15-05-2003 |
| | | | DE | 60100263 D1 | 18-06-2003 |
| | | | EP | 1134186 A1 | 19-09-2001 |
| | | | JP | 2001327851 A | 27-11-2001 |
| | | | | | |